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EXAMINER

SINGH, RAMNANDAN P

ART UNIT PAPER NUMBER

2644

DATE MAILED: 07/16/2004

5

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/038,367

Applicant(s)

USMAN ET AL.

Examiner

Ramnandan Singh

Art Unit

2644

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 October 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 October 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Drawings

1. Figures 2 and 4 should be designated by a legend such as --Prior Art-- because only those which are old are illustrated. See MPEP § 608.02(g). Corrected drawing sheets are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.
2. The drawings are objected to because Figures 2, 5, 6, 7 are in error. Fig. 2 shows a summing point wherein signal 225 must show "+" sign, and signal 215 "-" sign. A similar thing holds for Figures 5-7.
3. Further, the drawings are also objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Claim 8 recites the limitation "dividing said **second coefficients** into a **first set second coefficients** and a **second set of second coefficients**, and **converting said second set of second coefficients into the first coefficients**". This feature is not shown. A similar thing holds for claims 13 and 14-16. Further, claim 10 recites the "encoders and decoders" in

line 3. These are not shown. Therefore, the above features must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

4. The disclosure is objected to because of the following informalities:
 - (i) On page 16, line 16, the equation given therein is in error because the left-term of the equation is missing.

(ii) On page 16, line 20, the equation is in error because the right-term contains "V- V".

Appropriate correction is required.

Claim Objections

5. Claims 1, 4, 9, 14 and 18 are objected to because of the following informalities: Claim 4 recites "coefficients of **an infinite impulse response (IIR) filter**" in line 2. This is in error. Replace the term "**an infinite impulse response (IIR) filter**" with the term "**a finite impulse response (FIR) filter**". A similar thing holds for claims 9 and 18.

Further, claim 1 is also objected to because claim 1 recites converting a first set of FIR coefficients into an IIR filter whereas the specification requires converting a second set of FIR taps (i.e. truncated FIR coefficients) into an IIR filter [Applicant's specification; page 10, lines 15-19; page 17, lines 20-23; page 19, lines 16-19]. As a result, the description of claim 1 is inconsistent with the specification. A similar thing holds for claim 4.

Claim 14 is objected to because it recites "**second/coefficients**" in line 5. Replace the term "**second/coefficients**" with the term "**second coefficients**".

Appropriate correction is required.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

7. Claims 8, 13, 14-16 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claim 8 recites the limitation “dividing said second coefficients into a first set of second coefficients and a second set of second coefficients” in lines 3-4. The disclosure does not support this limitation. A similar thing holds for claims 13 and 14-16.

8. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

9. Claims 1, 4, 11 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 recites the limitation “converting **said FIR filter** into an infinite impulse response (IIR) filter” on page 21, line 14. Since there are two sections of the FIR filter—the FIR filter having a plurality of first coefficients, and the FIR filter having a plurality of

second coefficients; **“said FIR filter”** does not specify a particular section of the FIR filter. This renders claim 1 indefinite. A similar thing holds for claims 4 and 11. For the purpose of this Office action, the Examiner assumes “said FIR filter ” to be **“the FIR filter having first coefficients”**.

Further, claim 1 recites the limitation “converting said FIR (having a **first set of coefficients**) into an infinite impulse response (IIR) filter” whereas the specification requires converting a **second set of FIR taps** (i.e. truncated FIR coefficients) into an IIR filter [Applicant’s specification; page 10, lines 15-19; page 17, lines 20-23; page 19, lines 16-19]. As a result, claim 1 is **inconsistent** with the disclosure. This renders claim 1 indefinite. A similar thing holds for claim 4. See MPEP 2173.03.

Claim Rejections - 35 USC § 102

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

11. Claims 1-4, 6-7, 12 are rejected under 35 U.S.C. 102(b) as being anticipated by Gysel et al [US 5,633,863].

Regarding claim 1, Gysel et al teach an adaptive filter shown in Fig. 1, the adaptive filter comprising :

a filter input, **SS**, for receiving a first signal;

a filter output, **Y**, for outputting a second signal upon the first signal, to a summation device, **DAD**;

an error input, **ES**, for receiving an error input signal generated by a comparison of the second signal against a third signal (i.e. **output of AD**) [col. 5, lines 18-45]; and

a plurality of first coefficients, b_1, b_2, \dots, b_m , [Fig. 10] having plurality of poles and zeroes wherein the first coefficients are determined by deriving a finite impulse response (FIR) filter having a predetermined number of second coefficients [col. 3, lines 58-63], obtaining convergence of the second coefficients, converting the FIR filter section having the first coefficients into an infinite impulse response (IIR) filter [see Fig. 10], and updating the zeroes of the first coefficients based upon the error input signal while concurrently maintaining the poles of the first coefficients in a fixed state (i.e. **poles of the IIR filter are not changed during operation**) [col. 4, lines 20-24; col. 13, line 65 to col. 14, line 26; col. 18, lines 6-56].

Claims 4, 7, and 12 are essentially similar to claim 1 and are rejected for the reasons stated above.

Regarding claim 2, Gysel et al further teach applying a Least-Mean Square (LMS) algorithm to achieve the asymptotic convergence of the second coefficient (i.e. FIR filter) [col. 5, lines 46-57].

Claim 6 is essentially similar to claim 2 and is rejected for the reasons stated above apropos of claim 2.

Regarding claim 3, Gysel et al further teach updating (i.e. **optimally adapting**) the zeroes of the first coefficients (i.e. **zeroes of the IIR filter**) using a Least-Mean Square (LMS) algorithm [col. 14, lines 20-26; col. 5, lines 46-57].

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

13. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Johnson [US 6,141,406] in view of Williamson et al [IEEE Trans. on Signal Processing, Vol. 44, No. 6, June 1996; pp. 1418-1427].

Regarding claim 9, Johnson teaches a method for canceling an echo using an adaptive finite impulse response (FIR) filter shown in Fig. 15, comprising the steps of :

receiving a first signal, $x(n)$;

outputting a second signal, $y(n)$, wherein the second signal is a function of the filter coefficients and the first signal, $x(n)$; and

receiving an error signal, $error(n)$, generated by a comparison of the second signal, $y(n)$, against a third signal from a remote audio source [Fig. 1b; col. 6, lines 28-38; col. 4, lines 61-65].

Although Johnson teaches **an alternative method** using an adaptive infinite impulse response (IIR) filter wherein the output of the given FIR filter is the same as that of the IIR filter, he does not disclose expressly how an equivalent IIR filter is derived from a given FIR filter [col. 10, lines 28-33]. So one of ordinary skill in the art would have been motivated to seek any known method suitable to convert an FIR filter into an IIR filter, such as Williamson et al.

Williamson et al teach a method comprising:

converting a given FIR filter having a set of poles and zeroes into an equivalent IIR filter, called dubbed fixed pole adaptive filter (FPAF) and;

updating only the zeroes of the IIR filter based upon the error signal maintaining the poles unchanged [page 1420, left column, Theorem 2].

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to apply the method of Williamson et al to convert a given FIR filter into an IIR filter. Thus it would have been possible to implement the adaptive FIR filter of Johnson with an adaptive IIR filter [Johnson; col. 10, lines 31-33].

14. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Li [US 6,549,587 B1] in view of Azriel [US 6,724,736 B1] and further in view of Williamson et al [IEEE Trans. on Signal Processing, Vol. 44, No. 6, June 1996; pp. 1418-1427].

Regarding claim 10, Li teaches a gateway 55(a) operative to transmit signal between a circuit-switched network 58 (i.e. **PSTN**) and a packet based network 56 shown in Fig. 5, comprising:

an echo cancellation device 70 (i.e. **echo canceller in Fig. 6**) whose block diagram is shown in Fig. 7, comprising:

a summing device 132 for summing a first signal 122(b) and a second signal 130a to produce an error signal 132(b) and;

an finite-impulse response (FIR) filter 130 comprising a filter input for receiving a third signal 126(a), a filter output for outputting the second signal 130a based upon the third signal 126(a) to the summation device 132, an error input for receiving the error signal 132(b) [Abstract; Fig. 7; col. 15, lines 46; col. 65, lines 48-53].

As it is well-known , the above packet based network is digital network and one would naturally need a plurality of analog to digital (A/D) and digital to analog (D/A) converters at each receiving end and transmitting end of the network to enable to communicate. Since Li does not teach expressly these converters, one of the ordinary skill in the art would have been motivated to seek known embodiments to enable two-way communications over the network. It would, therefore, have been obvious to use

any known set of A/D and D/A converters, such as that of Azriel, as the needed converters in LI.

Azriel teaches a plurality of A/D converter 95, D/A converter 93, A/D converter 107 and D/A converter 109, as shown in Fig. 4, to enable to communicate over a packet based network shown in Fig. 2 [col. 2, lines 6-10; col. 3, lines 24-33; col. 10, line 57 to col. 11, line 8].

Further, although Li teaches **an alternative method** using an adaptive infinite impulse response (IIR) filter wherein the output of the given FIR filter is the same as that of the IIR filter, he does not disclose expressly a structure of an IIR filter derived from a given FIR filter [col. 16, line 66 to col. 17, line 7; col. 25, lines 25-29; col. 26, lines 29-31]. So one of ordinary skill in the art would have been motivated to seek any known method suitable to convert an FIR filter into an IIR filter, such as Williamson et al.

Williamson et al teach a method comprising:

converting a given FIR filter having a set of poles and zeroes into an equivalent IIR filter, called dubbed fixed pole adaptive filter (FPAF) and;

updating only the zeroes of the IIR filter based upon the error signal maintaining the poles unchanged [page 1420, left column, Theorem 2].

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to apply the method of Williamson et al to convert a given FIR filter into an IIR filter. Thus it would have been possible to implement the adaptive FIR filter of Li with an adaptive IIR filter [Li; col. 26, lines 29-31].

15. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable Sugiyama [US 20020101981 A1] in view of Williamson et al [IEEE Trans. on Signal Processing, Vol. 44, No. 6, June 1996; pp. 1418-1427].

Regarding claim 11, Sugiyama teaches a multi-channel echo cancellation system, as shown in Fig. 24, for substantially reducing the presence of a plurality of undesired frequencies in first signals, wherein the first signals are transmitted across a plurality of channels, comprising:

al least one summation device 129 operative in each of the channels [Abstract; Figs. 1, 2A; Para. 0003; 0007; 0019; 0022].

Although Sugiyama teaches **an alternative method** using an adaptive infinite impulse response (IIR) filter wherein the output of the given FIR filter is the same as that of the IIR filter, he does not disclose expressly how an equivalent IIR filter is derived from a given FIR filter [Para. 0066; 0127; 0128]. So one of ordinary skill in the art would have been motivated to seek any known method suitable to convert an FIR filter into an IIR filter, such as Williamson et al.

Williamson et al teach a method comprising:
converting a given FIR filter having a set of poles and zeroes into an equivalent IIR filter, called dubbed fixed pole adaptive filter (FPAF) and;
updating only the zeroes of the IIR filter based upon the error signal maintaining the poles unchanged [page 1420, left column, Theorem 2].

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to apply the method of Williamson et al to convert a given FIR filter into an IIR filter. Thus it would have been possible to implement the adaptive FIR filter of Sugiyama with an adaptive IIR filter [Sugiyama; Para. 0066; 0127; 0128].

16. Claims 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Strait [US 6,266,367 B1] in view of Williamson et al [IEEE Trans. on Signal Processing, Vol. 44, No. 6, June 1996; pp. 1418-1427].

Regarding claim 17, Strait teaches a channel equalizing system for equalizing signals received in at least one channel [col. 1, lines 6-12; col. 2, lines 13-29; col. 3, line 51 to col. 4, line 11], as shown in Fig. 3, comprising:

an adaptive filter 316 having a filter input for receiving a first input 322; a filter output for outputting a second signal based on the first signal; an error input for receiving an error signal (not shown) [col. 2, lines 28-29]; and a plurality of first

coefficients having a plurality of poles and a plurality of zeroes [col. 4, line 45 to col. 5, line 15; col. 5, line 54 to col. 6, line 47; col. 8, lines 41-51].

Although Strait teaches an adaptive infinite impulse response (IIR) filter and a finite impulse response filter (FIR), he does not disclose expressly deriving an IIR filter is derived from a given FIR filter [col. 4, lines 56-67]. So one of ordinary skill in the art would have been motivated to seek any known method suitable to convert an FIR filter into an IIR filter, such as Williamson et al.

Williamson et al teach a method comprising:

converting a given FIR filter having a set of poles and zeroes into an equivalent IIR filter, called dubbed fixed pole adaptive filter (FPAF) and;

updating only the zeroes of the IIR filter based upon the error signal maintaining the poles unchanged [page 1420, left column, Theorem 2].

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to apply the method of Williamson et al to convert a given FIR filter into an IIR filter. Thus it would have been possible to implement the adaptive FIR filter of Strait with an adaptive IIR filter to avoid a FIR filter having a very large number of taps in order to cancel long impulse responses [Williamson et al; page 1418, left column].

Claim 18 is essentially similar to claim 2 and is rejected for the reasons stated above apropos of claim 17.

17. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gysel et al [US 5,633,863] as applied to claim 4 above, and further in view of Dowling [US 6,507,732 B1] and further in view of Kaelin et al [IEEE Int. Symp. on Circuits and Systems, 1993, May 3-6, Pages: 463-466, Vol. -I].

Regarding claim 5, Gysel et al further suggest optimally adapting the poles of the IIR filter to the existing system surroundings with the process set forth by Kaelin et al [Gysel et al; col. 14, lines 20-26], wherein Kaelin et al teach a recursive process to determine the optimal poles of an IIR filter based on an error input signal, $e(k)$, as shown in Fig. 1 [Kaelin et al; Abstract; Fig. 1; PP. 463-466]. No details on monitoring the error input signal are disclosed by the combination of Gysel et al and Keilin et al. So one of ordinary skill in the art would have been motivated to seek any known method suitable to monitor the error signal, such as the method of Dowling, as shown in Fig. 9, wherein Dowling teaches monitoring an error input signal, $E(Z)$, [See Fig. 6], for determining the adequacy of the echo canceller filter, $G(Z)$, for providing a stopping criterion [col. 34, lines 14-30].

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to apply the method of Dowling to monitor the error input signal, $e(k)$,

and use a threshold (not shown) to the error signal with the combination of Gysel et al and Kaelin et al to decide when to stop the recursive process of Kaelin et al (i.e. **re-determining the predetermined number of filter coefficients**) [Dowling: col. 34, line 27-30].

Conclusion

18. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

(i) Fan et al [IEEE Trans. On Acoustics, Speech, and Signal Processing, Vol. 36, No. 12, December 1988; pp. 1819-1834] teach an adaptive IIR echo canceller [entire document];

(ii) Eguchi et al [US 5,774,564] disclose both an adaptive FIR filter and an adaptive IIR filter for an echo canceller and an adaptive equalizer [col. 17, line 30 to col. 18, line 5].

19. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ramnandan Singh whose telephone number is (703)308-6270. The examiner can normally be reached on M-F(8:00-4:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Forester Isen can be reached on (703)-305-4386. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Ramnandan Singh
Examiner
Art Unit 2644

A handwritten signature in black ink, appearing to read 'RNS', is written to the right of the printed name and title.